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NORTHERN

Utilization Research & Development Division

Publications and Patents

July - December 1964

PROCUREMENT SECTION
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United States Department of Agriculture**

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Northern Utilization Research and Development Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Illinois 61604

Issued January 1965

INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Division is responsible for research on industrial utilization of the cereal grains—corn, wheat, barley, grain sorghum, and oats; and the oilseeds—soybeans and flaxseed.

Except for wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 400 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

R. J. Dimler, Director

REQUEST FOR INFORMATION

The results of the research of the Northern Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 26). As a convenient guide to our publications and patents, a list with abstracts is published semiannually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

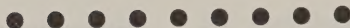
Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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[Compiled by reprint order number. Numbers marked (*) do not have reprints available for distribution.]

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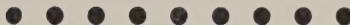
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PUBLICATIONS

[Publications marked (*) are not available for distribution. When requesting reprints, please order by number.]

1661A • Monitoring Countercurrent Distribution with a Recording Refractometer

R. O. BUTTERFIELD and H. J. DUTTON

Anal. Chem. 36(12):2358. November 1964

Subsequent to the original article, a new Teflon and glass pump has become available and has been used to transport solvents in place of the modified Toepler pump used previously. Because chemical inertness, elimination

of mercury, and a simpler control system are made possible, much improvement in reliability has been achieved. A revised wiring diagram and other pertinent details are available upon request.

1698 • Preparation and Polymerization of Vinyl Esters of Cyclic and Polychloro Fatty AcidsC. S. MARVEL,¹ J. C. HILL,¹ J. C. COWAN, J. P. FRIEDRICH, and J. L. O'DONNELL(¹University of Arizona, Tucson)

J. Polymer Sci., Part A, 2(6):2523-2532, June 1964

Homopolymers and vinyl chloride copolymers have been prepared from vinyl esters of mixed hydrogenated cyclized linolenic acid; 9,10-dichlorostearic acid; 9,10,12,13-tetrachlorostearic acid; 13,14-dichlorobehenic acid; 9(10)-phenylstearic acid; and technical behenic acid.

Vinyl 13,14-dichlorobehenate (29%)—vinyl chloride (71%) gave a copolymer with a brittle temperature of -2°C . All the other copolymers with vinyl chloride had brittle temperatures of 16°C . or higher and behaved more like rigid plastics.

1699* • Carbohydrates

FREDERIC R. SENTI and STIG R. ERLANDER

"Non-Stoichiometric Compounds," ed. L. Mandelcorn, chap. 9, pp. 568-605. New York. 1964

Complexes are formed between such carbohydrates as amylose, amylopectin, and Schardinger dextrans and various agents, like iodine-iodide, organic compounds, and metallic ions. A 7-membered α -1,4-linked glucose chain can form a complex with I_3^- , but a corresponding 6-membered chain cannot. Calculations show that the energy involved in forming this helix for the 7-membered (or more) chain is caused by a restriction of the movement of the chain (decrease in entropy) which is

presumably due to hydrogen bonding between the first and seventh glucose units. Resonance of the polyiodine chain for amylose chain lengths greater than 14 to 17 glucose units contributes little to the stability of the amylose- I_3^- complex. Theoretical treatments of this reaction are discussed in light of these calculations. A review of the literature shows the extreme variety of cyclodextrin complexes; e.g., increasing catalytic activity and complexing with gases, alcohols, and dyes.

1700 • Transacetalation of Methyl 9,9-Dimethoxynonanoate

E. H. PRYDE, D. J. MOORE, H. M. TEETER, and J. C. COWAN

J. Org. Chem. 29(7):2083-1085. July 1964

Various ester-acetal derivatives of azelaaldehydic acid were prepared by selective alcoholysis of methyl 9,9-dimethoxynonanoate, an intermediate derived from the ozonization of soybean oil methyl esters. Physical con-

stants were obtained for these derivatives, including boiling or melting point, refractive index, density, and molar refractivity.

1701 • Search for New Industrial Oils. XI. Oils of Boraginaceae

ROBERT KLEIMAN, F. R. EARLE, I. A. WOLFF, and QUENTIN JONES¹

(¹USDA Crops Research Div., Beltsville, Md.)

J. Am. Oil Chemists' Soc. 41(7):459-460. July 1964

Analysis of seed oils from 29 species of the family Boraginaceae revealed widespread occurrence of 6,9,12-octadecatrienoic and C₁₈ nonconjugated tetraenoic acids in addition to linolenic and other common C₁₆ and C₁₈

acids. The 6,9,12-octadecatrienoic acid ranged in amount from 0 to 27%, tetraene from 0 to 17%, and linolenic acid from 0.3 to 50%. Iodine values of the oils ranged from 88 to 225.

1702 • The Mt. Fuji Meeting. An International Symposium on Oilseed Protein Foods

A. K. SMITH

Soybean Dig. 24(10):18-20. August 1964

A brief review of the first international conference devoted solely to the advancement of oilseed protein foods. Soybeans, peanuts, cottonseed, sesame, and coconut were the five oilseeds included in the program as

sources of food proteins. Technologists from 20 countries participated in seeking their development into low-cost foods.

1703 • Production of Fungal Mycelial Protein in Submerged Culture of Soybean Whey

HELCIO FALANGHE, A. K. SMITH, and J. J. RACKIS

Appl. Microbiol. 12(4):330-334. July 1964

Various soybean whey media were tested as substrate for seven species of fungi in submerged culture. Compared to other species, *Tricholoma nudum* and *Boletus indicus* showed the greatest rate of growth and production of mycelial protein, the best utilization of soybean whey solids, and much shorter incubation times. In the presence of added ammonium acetate, *T. nudum* developed as spheres having diameters of about 5 to 8 mm. instead of the usual slurry or yeastlike form. *B.*

indicus always developed as spheres. Effects of ammonium salts, glucose, minerals, and concentrated whey on mycelial growth and yield of fungal protein were evaluated. About 4 to 6 grams of mycelial protein per liter can be obtained from fermentation in soybean whey, depending upon the medium used. Utilization of soybean whey by fungal fermentation may have economic value in whey disposal and in the production of products of high-protein content.

1704 • Cost of Fractionating Selected Hard and Soft Wheat Flours

V. E. SOHNS and K. R. MAJORS¹

(¹USDA Fed. Ext. Serv., Peoria, Ill.)

Am. Miller 92(7):6-9. July 1964

Preliminary cost estimates are reported for the fractionation of hard red winter (HRW) wheat and soft red winter (SRW) wheat flours by several typical combinations of fine grinding and air classification. For a hypothetical mill processing 2,000 sacks of flour per day, estimated fixed capital investments and processing costs for the several procedures described vary from \$106,000

to \$175,000 or 9.9 cents per hundredweight to fractionate HRW wheat flour to 13.6 cents for SRW wheat flour. The information presented can serve as a guideline in estimating fixed capital investments and processing costs for numerous other flour fractionating systems that use fine grinding and air classification.

1705 • Air Classification of Indiana, Ohio, and Michigan Soft Wheat Flours

A. J. PEPLINSKI, A. C. SRINGFELLOW, and E. L. GRIFFIN, JR.

Northwest. Miller 271(2):10-12. July 20, 1964

Flours from six varieties of SRW wheat from Indiana and Ohio and from two varieties of Michigan soft white winter (SWW) wheat, when fractionated by fine grinding and air classification, responded in terms of protein shifting, based on available protein, in the following order: Seneca SRW (highest), Thorne SRW, Lucas SRW, Knox SRW, Vermillion SRW, Dual SRW, Genesee SWW, and Avon SWW (lowest). With similar fractionation

schemes, the greatest range of protein content was obtained from Seneca SRW flour (2.7 to 29.1%); the lowest, from Avon SWW (2.4 to 19.8%). Each of the flours yielded a fraction containing about 20% protein and one with 3% or less protein. The Ohio SRW varieties gave higher protein shifting and wider ranges of compositions than did the Indiana SRW or Michigan SWW varieties.

1706* • Techniques of Separation. D. Countercurrent Distribution

C. R. SCHOLFIELD

"Fatty Acids. Their Chemistry, Properties, Production, and Uses,"

2nd ed., ed. K. S. Markley, part 3, chap. XX, pp. 2283-2307.

New York. 1964

Countercurrent distribution (CCD) as described by Craig is a scheme by which multiple batch extractions are done so that each step corresponds to a term of the binominal expansion. The use of automatic equipment capable of performing several thousand equilibrations per hour makes possible separations that would be impracticable if performed by hand in separatory funnels.

In this review are described CCD principles and the

apparatus used. Equations are presented for the calculation of partition coefficients, position of bonds, and degree of separation. The choice of solvent systems is also discussed. In applying the CCD technique in the analysis and purification of fatty acids, methyl esters, triglycerides, fatty acid oxidation products, and monoglycerides, the solvent systems used and the results obtained with these compounds are described.

1707* • Periodates, Electrolytic Preparation

HOWARD F. CONWAY and EARL B. LANCASTER

"Encyclopedia of Electrochemistry," ed. C. A. Hampel,
pp. 890-892. New York. 1964

Periodates have been used for many years as reagents in a variety of analytical procedures for quantitative determination of both inorganic and organic chemicals. Although as chemicals they exhibit unusual versatility

and specificity, their industrial use has previously been limited by the high cost of preparative procedures. An efficient process is given that is now used commercially.

1708* • Dialdehyde Starch Preparation

HOWARD F. CONWAY and EARL B. LANCASTER

"Encyclopedia of Electrochemistry," ed. C. A. Hampel,
pp. 321-323. New York. 1964

Polymeric aldehydes produced by oxidation of starch with periodate are known as dialdehyde starches. For an industrial process, the dialdehyde starch should be

in a dry form, and the expensive oxidant should be recoverable. Various methods for oxidizing starch are given and compared, as well as efficient recovery methods.

1709 • Efficient Production of Biosynthetically Labeled Fatty Acids

T. L. MOUNTS and H. J. DUTTON

J. Am. Oil Chemists' Soc. 41(8):537-539. August 1964

By short-term exposure of a photosynthesizing oilseed plant at seed-setting stage to high levels of $C^{14}O_2$, radio-

activity is efficiently incorporated into glycerides yielding randomly labeled fatty acids of high specific activity.

1710* • Agronomic Performance and Chemical Composition of the Seed of Sunflower Hybrids and Introduced VarietiesM. L. KINMAN¹ and F. R. EARLE(¹USDA Crops Research Div., College Station, Texas)

Crop Sci. 4(4):417-420. July-August 1964

Sunflower varieties introduced from the USSR were compared with North American hybrids at several locations. The introduced strains were higher in oil content than any of the American hybrids but lower in yield than the best American hybrids. The linoleic acid per-

centage of the oil was comparable in the two groups. The higher levels of linoleic acid were produced when seeds developed during cool weather. All oils contained about 2% of minor components not usually recognized as occurring in sunflower oil.

1711 • Base-Catalyzed Preparation of Methyl and Ethyl Esters of Carboxylic Acids

FRANK H. STODOLA

J. Org. Chem. 29(8):2490-2491. August 1964

In the presence of dicyclohexylethylamine or tris(2-hydroxypropyl)amine, carboxylic acids can be converted in good yields to methyl esters by heating at 95°C. for a short time with an excess of dimethyl sulfate in ace-

tone or methanol solution. Ethyl esters can be prepared in the same way except that the amount of diethyl sulfate must be limited to 1 mole per equivalent of acid.

1712 • Effects of Buffer Cations on Chromatography of Proteins on Hydroxylapatite

W. J. WOLF and DAYLE ANN SLY

J. Chromatog. 15(2):247-250. July 1964

Chromatography of soybean proteins on hydroxylapatite with linear phosphate buffer gradients yields four major fractions. The concentration of phosphate required to elute a given protein fraction depends upon

the buffer cation; the order of decreasing eluting power is K^+ , NH_4^+ , and Na^+ . A cation effect is also observed when bovine plasma albumin is chromatographed.

1713 • High-Potency Amyloglucosidase-Producing Mold of the *Aspergillus niger* Group

K. L. SMILEY, M. C. CADMUS, D. E. HENSLEY, and A. A. LAGODA

Appl. Microbiol. 12(5):455. September 1964

An *Aspergillus* sp. NRRL 3112, belonging to the *A. niger* group, produces from 10 to 12 units of amyloglucosidase per milliliter in a simple medium of whole ground

corn. Transglucosylase is produced only in trace amounts. Consequently, this culture should be of potential use to the enzyme and corn sugar industry.

1714 • 1964 Soybean Research at the Northern Regional Research Laboratory

L. L. MCKINNEY

Soybean Dig. 24(11):34-39. September 1964

Trends and demands in current markets are traced. Edible uses of soybean oil are considered, such as in shortening, margarine, and cooking and salad oils. Special emphasis is given to export markets and future

research needs to exploit them further. The flavor problem of soybean oil is reviewed briefly, as well as its nonfood uses. Tabular information is given to illustrate each of these fields.

1715 • Denaturation of Soybean Globulins by Aqueous Isopropanol

W. J. WOLF, DAYLE ANN SLY, and G. E. BABCOCK

Cereal Chem. 41(5):328-339. September 1964

Soybean globulins were treated with aqueous isopropanol, dried, and dialyzed against buffer at pH 7.6, ionic strength 0.5, containing 0.01 M mercaptoethanol. Insolubility of the proteins in the buffer was used as a criterion of denaturation. Effects of isopropanol concentration, time, and temperature of isopropanol treatment on solubility of the proteins in buffer were studied. Ultracentrifugal and chromatographic analyses of the proteins soluble in buffer showed the 7S, 11S, and 15S

components to be denatured by isopropanol at 25°C., whereas the 2S component was undenatured. Maximum denaturation in 2 hours at 25°C. occurred with 40% isopropanol, and the 7S component showed the greatest susceptibility to denaturation. Increasing temperature of the alcohol treatment to 50° or 75°C. increased the rate of denaturation and also caused the 2S fraction to be denatured, although at a slower rate than the other three fractions.

1716 • Micro Vapor-Phase Hydrogenation Monitored with Tandem Chromatography-Radioactivity

H. J. DUTTON and T. L. MOUNTS

J. Catalysis 3(4):363-367. August 1964

Vapor-phase reactors monitored by gas chromatography have been reported for catalytic oxidation, polymerization, and cracking; but so far catalytic vapor-phase hydrogenation studies have been limited to unsaturated hydrocarbons. With esters and other hetero compounds, fission rather than hydrogenation takes place under conditions mandatory for vapor-phase hydrogenation. Conditions permitting hydrogenation of fatty acid methyl esters are described, as well as a technique to evaluate catalysts and to obtain kinetic data. These data

have been simulated on an analog computer and approximate specific rate constants calculated. Using both thermal-conductivity and radioactivity detectors permits isotopic experiments to be performed with labeled intermediates. Application of the technique is illustrated by the reduction of methyl esters of 9-octadecenoate to methyloctadecanoate; 9,12-octadecadienoate to octadecenoate to octadecanoate; and inactive 9,12-octadecadienoate in the presence of 9,15-octadecenoate-H³.

1717 • Upgrading Amylose Content of Amylomaize Starch by Butanol Complexing

R. A. ANDERSON and V. F. PFEIFER

Die Stärke 16(7):209-211. July 1964

Engineering studies on the fractionation of amylomaize starches by butanol complexing have illustrated the feasibility of using this method to upgrade the amylose content of these new starches. Products have been obtained from commercial amylomaize starches, in good

yields, with amylose contents in excess of 80%. Films prepared from the upgraded amylose products have clarity and fold endurance properties comparable to those of films from commercially available amyloses.

1718 • Corn Dry-Milling: A Comparative Evaluation of Commercial Degerminator Samples

O. L. BREKKE and L. A. WEINECKE

Cereal Chem. 41(5):321-328. September 1964

Samples of degerminator product streams from four processors using cone mills, granulators, or disk mills as degerminators were fractionated in the laboratory to give data on yields and oil content of grits of several sizes, fines, germ, and hull. Disregarding variations resulting from differences in the corn processed and the

tempering conditions used, the cone mill gave the best degermination, but the disk mill produced the most recoverable oil, and the granulator, an intermediate amount of oil. From the data presented, which should be useful to those working for improved degermination, the possibility of a shorter milling flow is suggested.

1719 • Influence of Preparative Variables on Intrinsic Viscosities and Sedimentation Values of Periodate-Oxidized Starches

W. C. SCHAEFER, R. C. BURR, C. R. RUSSELL, G. E. BABCOCK,
and C. E. RIST

Cereal Chem. 41(5):406-412. September 1964

A study was made on the effects of reaction conditions and isolation techniques on solution properties of periodate-oxidized corn starch having from 5 to 96% of the anhydroglucose units oxidized to the dialdehyde structure. Samples were prepared for viscosity and ultracentrifugal studies by dispersion in 0.5 *N* potassium hydroxide containing 25% (w/v) urea after the aldehyde groups were reduced with potassium borohydride to the corresponding primary alcohols. The polyol thus formed is stable toward alkali.

On the basis of measurements of solubility, sedimentation velocity, and intrinsic viscosity, the effects of

preparative variables on particle size may be summarized thus: Crosslinking occurred during oxidation of granular starch and was most extensive at intermediate levels of oxidation. More crosslinking occurred at a reaction temperature of 35°C. than at 1°C. Less crosslinking occurred during oxidation of pasted starch than of granular starch. Drying at 105°C. instead of at room temperature caused little degradation. Granular, 96%-oxidized starch became crosslinked when treated at pH values less than 4, but degraded at higher pH values. This degradation was shown to reduce the efficacy of oxidized starch as a wet-strength additive in paper.

1720 • Preparation and Properties of Acid-Modified Cereal Flours

J. C. RANKIN, J. H. SAMALIK, MARGARET M. HOLZAPFEL,
C. R. RUSSEL, and C. E. RIST

Cereal Chem. 41(5):386-399. September 1964

Cereal flours were partially depolymerized by a dry-state method to give products having paste viscosities suitable for a number of industrial sizing and adhesive applications. Dry flours were treated with small amounts of dilute hydrochloric acid followed by neutralization with aqueous base. The effect of reaction times of 6 minutes to 48 hours at temperatures of 25° to 45°C. was investigated. Flours treated with amounts of dilute

acid equivalent to 0.80 to 2.40 weight-percent hydrogen chloride on a dry-flour basis were converted in 1 to 8 hours at 28° to 37°C. to products with suitable viscosities for tub-sizing paper. These products contained less than 3% reducing sugar, had high apparent amylose content, and in laboratory-scale sizing imparted high-strength increases to paper.

1721 • Determination of Hydroxyl Number of Polyoxyalkylene Ethers by Reaction with Toluene Diisocyanate

F. H. OTEY, BONNIE L. ZAGOREN, and C. L. MEHLTRETTER

J. Appl. Polymer Sci. 8(5):1985-1989. September 1964

A new method for hydroxyl analysis is described in which excess toluene diisocyanate is reacted with a hydroxy compound, preferably in the presence of a catalyst, and the unreacted isocyanate is determined with dibutylamine reagent. The method is particularly suitable for

polyethers intended for urethane foam preparations. It is rapid, is accurate, and has the added advantage of including such impurities as would be expected to consume isocyanate during a foam preparation.

1722 • Application of a Hammett-Taft Relation to Kinetics of Alkylation of Amino Acid and Peptide Model Compounds with Acrylonitrile

MENDEL FRIEDMAN and JOSEPH S. WALL

J. Am. Chem. Soc. 86(18):3735-3741. September 1964

The reaction rates of amino acid and peptide model compounds with α,β -unsaturated systems were studied as a function of pH of the reaction medium, pK_a of the amino group, temperature, and structure of the amino and vinyl compounds. Logarithms of the second-order rate constant varied linearly with pH on the alkaline side, and at any given pH the rates decreased with increasing pK_a 's of the amino groups. Correction of the second-order rate constants to identical amino acid anion concentration gave a series of computed rate

constants whose logarithms showed a direct linear dependence on the pK_a 's of the amino groups in similar steric environments. A quantitative estimate of the influence of the steric and polar parameters on the rates was obtained from a Hammett-Taft free-energy relationship. The derived equation should be considered an extension of the Taft relationship to amino acids and peptides and should be useful for predicting reaction rates in nucleophilic displacements and additions of amino acids, peptides, and proteins.

1723 • Publications and Patents of the Northern Utilization Research and Development Division, January-June 1964

North. Util. Res. Develop. Div.

U. S. Agr. Res. Serv., unnumb. pub., 32 pp. July 1964

1724 • The Genus *Absidia*: *Congronella* and Cylindrical-Spored Species of *Absidia*

C. W. HESSELTINE and J. J. ELLIS

Mycologia 56(4):568-601. July-August 1964

The synonymy of the genus *Absidia* is discussed, and a new subgenus *Mycocladus* is proposed to include all species of *Absidia* that have suspensors without long fingerlike projections surrounding the zygospore. The species of *Absidia* with cylindrically shaped spores are described, and the following new taxa are proposed: *A. anomala*, *A. psychrophilia*, and *A. cylindrospora* var.

nigra. The species *A. parricida* is validated. Species recognized as belonging to this group of *Absidia* are: *A. parricida*; *A. anomala*; *A. spinosa* and its varieties *azygospora*, *madecassensis*, and NRRL 2033; *A. psychrophilia*; *A. heterospora*, *A. fusca*; *A. pseudocylindrospora*; and *A. cylindrospora* and its varieties *nigra* and *rhizomorpha*.

1725 • Conformational Studies of Wheat Gluten, Glutenin, and Gliadin in Urea Solutions at Various pH's

Y. VICTOR WU and ROBERT J. DIMLER

Arch. Biochem. Biophys. 107(3):435-440. September 1964

Viscosity, sedimentation velocity, ultraviolet difference spectra, and optical rotatory dispersion measurements were carried out on wheat gluten, glutenin, and gliadin in 3 M urea plus 0.11 M KCl plus 0.02 M buffer at pH 3 to 10 at 25°C. or room temperature. An increase in intrinsic viscosity and a decrease in sedimentation coefficient for glutenin at pH 10 compared with that at pH 4 are consistent with an increase in asymmetry of the protein molecule. Parameters from optical rotatory

dispersion studies on glutenin also indicate a conformational change at pH 10. Some increases in intrinsic viscosity were also observed for gluten and gliadin at pH 10, but the increase for gliadin might not be significant. The absence of tyrosine and tryptophan peaks in the ultraviolet difference spectra of gluten, glutenin, and gliadin suggests that these two amino acids are not involved in any interaction with other groups.

1726 • Simplifies Full-Fat Soy Flour Process

GUS C. MUSTAKAS and DEAN H. MAYBERRY

Food Eng. 36(10):52-53. October 1964

A process was developed that economically converts soybeans to a palatable, nutritious food with a good shelf life. In cooperation with the United Nations Children's Fund and an industrial company, a high-protein, full-fat flour was made by adapting an industrial system. In the process, soybean flakes or grits are preconditioned

at 212°F. to 18 to 21% moisture; raised in 60 to 90 seconds to high pressure by a screw working in a closed barrel cylinder; extruded through ¼-inch die openings; cooled; dried; and milled to flour. (See 1733 for a technical explanation of the process.)

1727 • Evaluation of Fatty Vinyl Ether Polymers and Styrenated Polymers for Metal CoatingsB. G. BRAND,¹ H. O. SCHOEN,¹ L. E. GAST, and J. C. COWAN(¹Battelle Memorial Institute, Columbus, Ohio)

J. Am. Oil Chemists' Soc. 41(9):597-599. September 1964

A further evaluation of fatty vinyl ether polymers as potential coatings for metals (particularly cans) includes studies on 12 linseed and soybean polymers containing isobutyl vinyl ether and cyclopentadiene. Baked films with and without driers from these homo-, co-, and ter-polymers and their styrenated derivatives were examined for flexibility, adhesion, chemical resistance, and

hardness. Film properties were related to chemical composition of the polymers, including the effect of styrenation, linseed versus soybean polymers, and content of cyclopentadiene. Films possessed excellent flexibility, adhesion, and hardness. Surprisingly, for most polymers, the hardest films were obtained without driers.

1728 • A Convenient Laboratory Method for Preparing *trans,trans*-9,11-Octadecadienoic Acid

WILMA J. SCHNEIDER, L. E. GAST, and H. M. TEETER

J. Am. Oil Chemists' Soc. 41(9):605-606. September 1964

A convenient laboratory method to prepare *trans,trans*-9,11-octadecadienoic acid (TTA) via a polyester intermediate is described. Ricinelaidic acid was heated at 235°C. under vacuum for 3 to 4 hours to form a polyester having a molecular weight of 1,500 to 1,600. Pyrolysis of this polyester and simultaneous distillation

of the products gave crude dehydrated acids. TTA was crystallized from a 95% ethanol solution of these acids, in a yield of 35%. Of the variables affecting pyrolysis, molecular weight of the polyester had the greatest effect on yield of TTA.

1729 • Activation and Specificity of *Crambe abyssinica* Seed Lipase

H. L. TOOKEY and I. A. WOLFF

J. Am. Oil Chemists' Soc. 41(9):602-604. September 1964

The lipase of *Crambe abyssinica* seed is not active in crushed seeds stored at 5 to 7% moisture at room temperature. Lipase activity is very low even at 10 to 15% moisture:free acids in the crambe oil increased 1.6% to a total of 4% in 6 weeks. At higher moisture levels the lipase is active, hydrolyzing the oil in 5 to 7 weeks. Oil in whole seed is resistant to lipolysis when stored air-dry. These results indicate good stability of

the oil during seed storage and that the usual steps in seed processing can be followed.

Crambe lipase hydrolyzes triglycerides in a nearly random fashion. The hydrolysis pattern indicates a small preference for the shorter chain acids (C₁₆ and C₁₈), but no specificity for position within the triglyceride is apparent.

1730 • Mustard Seed Processing: Essential Oil Composition

L. D. KIRK, L. T. BLACK, and G. C. MUSTAKAS

J. Am. Oil Chemists' Soc. 41(9):599-602. September 1964

Processing oriental mustard seed to produce livestock feed and lipid-containing erucic acid has stimulated interest in the composition of the byproduct essential oil. The development of a method for analysis of this oil by gas-liquid chromatography has led to the demonstration of an equilibrium reaction between its two main

constituents. A similarity in composition and response to heat was also shown between the natural essential oil and oils prepared synthetically. These observed similarities should lead to a better understanding of the enzymatic reaction responsible for release of essential oil from mustard seed.

1731 • Hydrogenation of Linolenate. X. Comparison of Products Formed with Platinum and Nickel CatalystsC. R. SCHOLFIELD, R. O. BUTTERFIELD, V. L. DAVISON,
and E. P. JONES

J. Am. Oil Chemists' Soc. 41(9):615-619. September 1964

One mole of hydrogen per mole of ester was added to methyl linolenate over a platinum catalyst at 20°C. and atmospheric pressure. The product was separated into trienoic, dienoic, and monoenoic esters by counter-current distribution (CCD) with acetonitrile and hexane. Each of these ester fractions was further separated by CCD with methanolic silver nitrate and hexane.

Comparison with hydrogenations, in which a commercial nickel catalyst at 140°C. and atmospheric pressure was used, shows that with platinum more stearate is formed; i.e., the platinum hydrogenation was less selective. Also, a smaller amount of *trans* esters was formed with platinum, and there was less shift of double bonds from the original 9, 12, and 15 positions.

1732 • Interaction of Photophosphorylation and Electron Transport Systems in Bacterial Chromatophores

JACK W. NEWTON

J. Biol. Chem. 239(9):3038-3042. September 1964

The relationship of photophosphorylation to some photochemical electron transfer reactions in bacterial chromatophores was studied. Conditions that inhibited photophosphorylation stimulated photochemical electron transfer to low potential acceptors and vice versa. The two processes did not occur simultaneously. Possibly photophosphorylation and photoreduction compete with each other for energized components formed by the primary photomechanical process. This competition is regulated by ionic factors and the oxidation-reduction environment in a manner resembling "coupling."

As usually isolated in media of low ionic strength, the chromatophore particles appear strongly "committed" to photophosphorylation but undergo, in the presence of ionic high potential electron donors, an electron transport-mediated process analogous to uncoupling. This process results in suppression of adenosine triphosphate formation and initiation of light-induced electron transfer reactions, apparently by diversion of energized components from adenosine triphosphate synthesis to photochemical reductions.

1733 • **Production and Nutritional Evaluation of Extrusion-Cooked Full-Fat Soybean Flour**

G. C. MUSTAKAS, E. L. GRIFFIN, JR., L. E. ALLEN,¹ and
O. B. SMITH²

(¹UNICEF, United Nations, New York, N. Y.; ²Wenger Mixer
Manufacturing, Kansas City, Mo.)

J. Am. Oil Chemists' Soc. 41(9):607-614. September 1964

A processing method for preparing full-fat soybean flours for human consumption by a new extrusion-cooking method was developed. Biological evaluations were made of samples produced experimentally by this method to determine the best conditions for preparing a product of maximum nutritive value and stability. Twelve processed full-fat soybean flours, prepared under different conditions, were evaluated by means of chemical analyses, biological assays, available lysine content, organoleptic and bacteriological tests, and oxidative stability storage tests. Flour of high nutritive value and

good stability can be prepared by preheating unextracted soybean flakes or grits to 200° up to 212°F., premixing and adding sparge steam at 212°F. to adjust moisture content between 18 and 21%, extruding for 1 to 1.5 minutes with the final extrusion temperature reaching 250° to 290°F., cooling, drying, and grinding. Clinical testing of the flour with infants up to 12 months of age has begun in two Far Eastern countries on a fairly extensive scale, and completed results should be available sometime in 1965.

1734 • **Strontium-90 in 1963 United States Wheat**

V. F. PFEIFER and A. J. PEPLINSKI

Radiol. Health Data 5(6):282. June 1964

Wheat supplies from the 1963 crop year were procured from major wheat-producing areas in the United States. After the wheats were cleaned to remove chaff and dust, strontium-90 was determined in each of the 23 lots obtained. Lowest levels of contamination were in Pacific Northwest soft white winter wheat and in

Ohio soft red winter wheat. Although sampling was not sufficiently extensive to be fully representative, the analyses tend to confirm the predictions made by AEC officials that an average level of strontium-90 in 1963 U. S. wheats would be between 200 and 300 picocuries per kilogram.

1735 • **Strontium-90 in Plant Parts and Milling Fractions from a 1963 Illinois Wheat**

V. F. PFEIFER, A. J. PEPLINSKI, and J. E. HUBBARD

Radiol. Health Data 5(6):283-284, 284a. June 1964

Ponca hard red winter wheat plants, 1963 crop, were cut near the ground; weight distribution, chemical composition, and strontium-90 content were determined for hand-separated plant parts. The hand-separated kernels and combined wheat from the same field were milled and analyzed similarly. Although the wheat kernels

amounted to almost one-half of the weight of the above-ground plants, they contained less than one-tenth of the total strontium-90 present in the plants. Flour fractions separated from the wheat contained only about 1% of the total strontium-90 present in the aboveground wheat plants.

1736 • Economics of Air Classifying Typical Wheat Flours

W. K. TROTTER¹ and D. L. MILLER

(¹USDA Econ. Res. Serv., Peoria, Ill.)

Am. Miller 92(6):8-11, June 1964

An analysis that examines the following premise: the premium value of the high-protein fraction obtained in air classifying wheat flour and the savings on wheat procurement costs should allow a high-starch fraction to enter industrial uses in competition with low-cost starches from other sources. Prospective returns from a range of production methods for both hard and soft

wheats were compared. Although procedures that included the industrial fraction were least profitable to the miller, still they might be worthwhile under certain conditions: (1) Excess capacity for low-protein flours, (2) additional demand for high-protein flour, and (3) a price for the added output above the mill's marginal cost—the extra cost of producing the additional flour.

1737 • Radionuclides in Wheat and Other Agricultural Products—A Review

V. F. PFEIFER

Cereal Sci. Today 9(8):354-357, October 1964

This literature review deals with radionuclides present in wheat and flour, the contribution made by wheat and flour to the total intake of strontium-90 and cesium-137 in our food supply, and variations in the levels of strontium-90 in U. S. wheat and flour during the past 5 years.

The strontium-90 content of 1962 wheat increased markedly over 1960 and 1961 wheats because of resumption of testing nuclear weapons in the fall of 1961. Published reports of strontium-90 in the various fractions

resulting from wheat milling showed that the patent flour fraction retained about 9% of the total present in the starting wheat, clear flour about 5%, and feed fractions about 86%. It has been estimated that human consumption of cereals and foods made from them contributes about 20% of our total intake of strontium-90 and about 7% of our total intake of cesium-137.

Investigations now underway at the Northern Laboratory are concerned with treatments to be applied to wheat or flour to reduce the content of strontium-90.

1738 • Continuous Production of Cyclic Fatty Acids

R. E. BEAL, R. A. EISENHAUER, and E. L. GRIFFIN, JR.

J. Am. Oil Chemists' Soc. 41(10):683-685, October 1964

Kinetic studies of a batch treatment of linseed oil to produce cyclic acids indicated that a continuous process might be feasible if conducted in a flow-through reactor involving rapid heat-up of reactants and followed by a short reaction time. Tests were made in such a continuous system to examine the effects of flow rate (retention time), reaction temperature, reaction system pressure, and reagents on product yields. The reactant solution (linseed oil-ethylene glycol-sodium hydroxide) was

pumped through an externally heated tube and discharged through a back-pressure valve. Maximum cyclic acid yields based on weight of oil were 37% by the continuous method and 40.4% by the batch process when the feed was saturated with nitrogen, and were 39.5% and 46.1% for the respective methods when the feed was saturated with ethylene. These differences may be offset by the advantages inherent in a continuous process.

1739 • Inactivation of Sexual Agglutination in *Hansenula wingei* and *Saccharomyces kluyveri* by Disulfide-Cleaving Agents

NEIL W. TAYLOR

J. Bacteriol. 88(4):929-936. October 1964

Mating types of both *Hansenula wingei* and *Saccharomyces kluyveri* can be activated to produce uniformly strong sexual agglutination by treatments with various solvents, such as 8 M LiBr. The strongly agglutinative mating-type preparations were irreversibly inactivated by various chemical treatments. Disulfide-cleaving reagents inactivated type 5 of *H. wingei* but not type 21; type 3 of *S. kluyveri* was more sensitive to them than type 26. Comparison of sensitivities to these reagents and to other treatments, plus a moderately strong cross agglutination between type 3 and type 21, indicated

that the sexually agglutinative elements on type 3 are similar to type 5 and those on type 21, to type 26. Inactivation rate experiments showed a loss of agglutinative ability according to a sigmoid decrement with time for both types 5 and 21. The apparent extent of inactivation depended markedly on agglutination test conditions. These experiments were interpreted to indicate tentatively, first, that the agglutinative elements of both types of a species are proteins and, secondly, that several agglutinating linkages are formed between any two cells in sexual agglutination.

1740 • Extracellular Polysaccharide Produced from Glucose by *Cryptococcus laurentii* var. *flavescens* NRRL Y-1401: Chemical and Physical Characterization

ALLENE JEANES, J. E. PITTSLEY, and P. R. WATSON

J. Appl. Polymer Sci. 8(6):2775-2787. November 1964

This macromolecular polysaccharide is composed of D-mannose, D-xylose, D-glucuronic acid (as the potassium salt), and a small proportion of O-acetyl groups. Factors favorable to practical application of this hydrocolloid are its adaptability to large-scale production, its stability in storage, and the properties of its homogeneous dispersions. Dispersions in water or aqueous alcohol are highly viscous and tend to soft gelation. Dispersions

in water show plastic rheological characteristics and thixotropy with rapid regain of viscosity after shear. Moderate decreases in viscosity result from the presence of electrolytes or from heating, and only small differences in viscosity occur in the pH range 4-11. Indications are that variation in properties of the polysaccharide product may depend upon fermentation conditions.

1741 • Pilot-Plant Studies on the Fractionation of Amylomaize Starch

R. A. ANDERSON, V. F. PFEIFER, and V. E. SOHNS

Cereal Sci. Today 9(9):398, 400, 402, 418. November 1964

Commercial amylomaize starches, fractionated in a pilot plant by a simplified complexing procedure, yielded products containing from 80 to 90% apparent amylose. Complexing agents used in the fractionation were capric and caprylic acids, 1-octanol, 1-decanol, and a commer-

cial blend of decyl-octyl alcohol. A complete process, together with cost estimates, is presented for the fractionation of two amylomaize starches with decyl-octyl alcohol.

1742 • A Physical Study of the Degradation of Periodate-Oxidized Amylose

STIG R. ERLANDER, H. L. GRIFFIN, and F. R. SENTI

Biopolymers 2(4):327-335. August 1964

Changes in the viscosity of amylose oxidized in an aqueous medium at pH 3.0 by sodium metaperiodate were followed as a function of time. Levels of 20, 40, 60, 80, and 100% periodate oxidation were attained. The rate of hydroxyl ion cleavage of the periodate-oxidized amylose [$d(1/[\eta]^2)/dt = k$] is proportional to the square of the degree of oxidation. That is, the hydroxyl ion hydrolysis of periodate oxyamylose occurs predominately at the site where two or more oxidized units exist side by side. A reaction mechanism is postulated to account for this slow breakdown of an

isolated oxidized unit and for the fast degradation of two adjacent oxidized glucose units. When two or more oxidized units exist side by side, the free aldehyde at carbon atom 3 is believed to be in equilibrium with a hydrate instead of a hemiacetal structure as in the case of a single, isolated, oxyglucose unit in amylose. The greater reversibility of the hydrate to the free aldehyde structure results in a greater possibility of β -alkoxycarbonyl elimination at sites where two or more oxidized glucose units exist side by side.

1743 • Antibiotics Against Plant Disease. VIII. Screening for Nonpolyenic Antifungal Antibiotics Produced by Streptomycetes

L. A. LINDENFELSER, ODETTE L. SHOTWELL, MARILYN J. BACHLER,
GAIL M. SHANNON, and T. G. PRIDHAM

Appl. Microbiol. 12(6):508-512. November 1964

In a survey of *Streptomyces* species for their ability to produce antibiotics, methods were designed and followed that would specifically select strains capable of producing heat-stable, nonpolyenic, antifungal antibiotics. Of 500 strains grown in shaken flasks, 240 of the culture liquors contained active factors; 166 were nonpolyenic as determined by absorption spectra. Heat-

stability tests of the nonpolyenic antibiotics over a broad pH range revealed that 15 were stable under all test conditions, 70 moderately stable, and 81 unstable. Paper chromatography and cross-antagonism tests revealed that two of the antibiotics were cycloheximide and musarin. Six antibiotics, presumably new, were detected.

1744 • Homogeneous Hydrogenation of Methyl Linoleate Catalyzed by Iron Pentacarbonyl. Characterization of Methyl Octadecadienoate-Iron Tricarbonyl Complexes

E. N. FRANKEL, E. A. EMKEN, HELEN M. PETERS, V. L. DAVISON,
and R. O. BUTTERFIELD

J. Org. Chem. 29(11):3292-3297. November 1964

Iron pentacarbonyl is an effective, soluble catalyst for the hydrogenation of methyl linoleate. Monoenoic fatty esters, the major products, show considerable geometric and positional isomerization. Intermediates important in the reduction include conjugated dienes and their complexes with iron carbonyl. Distribution of double bonds in the monoenes can be accounted for by a nonselective reduction of either double bond of the intermediate conjugated dienes. Stable iron carbonyl

complexes of conjugated dienes are formed by reacting methyl linoleate and $\text{Fe}(\text{CO})_5$ at 180°C . under either hydrogen or nitrogen pressure. Pure complexes are separated by either countercurrent distribution or alumina chromatography. Elemental and spectral analyses, NMR, and degradative studies characterize the complexes as mixtures of isomeric, conjugated methyl octadecadienoate-iron tricarbonyl.

1745 • A $C_{15}H_{22}O_4$ Compound Produced by the Fungus *Aspergillus fischeri* var. *glaber*

J. J. ELLIS, FRANK H. STODOLA, RONALD F. VESONDER, and
CURTIS A. GLASS

Nature 203(4952):1382. September 26, 1964

A strain of the fungus *Aspergillus fischeri* var. *glaber* was found to produce a crystalline product in a liquid medium containing malt extract, peptone, and D-glucose.

Preliminary studies indicate that the substance is a dilactone with a molecular formula of $C_{15}H_{22}O_4$. Structural studies are in progress.

1746 • A Unique Sugar Orthoester

B. S. SHASHA, W. M. DOANE, C. R. RUSSELL, and C. E. RIST

Nature 204(4954):186-187. October 10, 1964

A unique sugar orthoester was formed on treatment of 1,2-*O*-isopropylidene- α -D-glucofuranose 5,6-thionocarbonate with methyl iodide and silver oxide. None of the expected 3-*O*-methyl derivative was formed, but rather 1,2-*O*-isopropylidene-3,5,2-*(S*-methyl monothioor-

thocarbonate)- α -D-glucofuranose was isolated in good yield. The structure of this orthoester was formulated on the basis of composition, molecular weight, and absorption spectra and by conversion to known compounds.

1747 • Automated Manometric Apparatus

E. D. BITNER and H. J. DUTTON

J. Am. Oil Chemists' Soc. 41(11):720-723. November 1964

A manometric system has been developed for automatically performing hydrogenations, autoxidations, and similar gas-liquid phase reactions. Incorporation of an ion chamber permits radioactive isotope experiments. Nonradioactive isotopes (such as deuterium and O^{18}) are monitored by attaching the apparatus to a mass spectrometer. Automatic recording of gas volume and radioactivity establishes a permanent record and allows unattended operation. Use of a servomotor-driven syringe eliminates all mercury, including mercury level-

ing bulbs. The flow-through construction of the syringe permits circulation of the gas phase and, as required in isotopic experiments, obviates the dead space inherent in classical manometers. Basic electronics and readily available components enhance operation and construction. Typical hydrogenations with accompanying graphs showing gas uptake, reaction time, and radioactivity concentration illustrate the utility of the apparatus and the ease of collecting data.

1748 • Determination of Beta-Olefinic Methyl Groups in Esters of Fatty Acids by Nuclear Magnetic Resonance

CURTIS A. GLASS and HERBERT J. DUTTON

Anal. Chem. 36(13):2401-2404. December 1964

An analytical method for determining 15,16-unsaturation in fatty acids by nuclear magnetic resonance spectroscopy is described. Utilized in the determination are the low field member of the β -olefinic methyl proton triplet and the central peak of the non- β -olefinic methyl

proton triplet. Areas of these signals are determined by an instrumental integrator and by paper tracings, and precision of the two methods is compared. Application to the kinetics of hydrogenation is also presented.

1749 • Source and Multiplier Modifications of a Time-of-Flight Mass Spectrometer to Increase Sensitivity

W. K. ROHWEDDER, E. SELKE, and E. D. BITNER

Appl. Spectry. 18(5):134-136. September 1964

The usefulness of a gas chromatograph and a mass spectrometer in tandem to analyze odor constituents is limited by the sensitivity of the mass spectrometer and by the large amount of helium carrier gas compared with the amount of sample. A time-of-flight mass spectrometer was fitted with a tightly enclosed source and operated in a continuous ionization mode to increase

instrument sensitivity. A gate pulse was applied to the front end of the magnetic electron multiplier to eliminate the electrons due to the helium pulse before they reached the multiplier dynode strips. This procedure prevented saturation of the multiplier by the helium carrier gas.

1750 • Structure of Ramulosin, a Metabolic Product of the Fungus *Pestalotia ramulosa*

F. H. STODOLA, C. CABOT, and C. R. BENJAMIN

Biochem. J. 93(1):92-97. October 1964

Ramulosin, a $C_{10}H_{14}O_3$ compound (m.p. 120°C.) produced by the fungus *Pestalotia ramulosa*, was shown to be a β -keto lactone by hydrolysis behavior and by ultraviolet and infrared spectra. Formation of a copper chelate salt indicated that the two functional groups are not in the same ring. These data and a consideration of the structures of analogous fermentation products

suggested that ramulosin is the enol chelate of perhydro-3-methyl-1,8-dioxo-2-benzopyran. This structure was confirmed by conversion of ramulosin to a $C_8H_{10}O_2$ ketol, which yielded the expected 1-cyclohexyl-propanol-2 on removal of the carbonyl group by a Wolff-Kishner reaction.

1751 • Isolation of Starch from Corn and Amylomaize after a Neutral Chemical Steep

EDNA M. MONTGOMERY, K. R. SEXSON, and R. J. DIMLER

Die Stärke 16(10):314-320. October 1964

A laboratory investigation of the wet milling of corn and amylomaize has been carried out. Agents used to attack the corn protein, and to swell and hydrate the corn, were sodium diethyldithiocarbamate and sodium sulfide. In milling, addition of sodium chloride to the water to increase ionic strength aided in separation of starch from the gluten. The new steeps were as effective as the well-known sulfurous acid steep as shown by the

high recovery of starch with a low-protein content; they also permitted good separation of the germ. Moreover, the new steeps are effective at neutral pH, 38°C. during 24 hours, whereas the sulfurous acid steep requires an acid pH at 55°C. during 40 to 48 hours. Advantages of the milder conditions of the neutral steeps are: satisfactory preservation of the chemical structure, granule structure, and physical properties of starch.

1752 • A Naturally Occurring Allenic Acid from *Leonotis nepetaefolia* Seed Oil

M. O. BAGBY, C. R. SMITH, JR., and I. A. WOLFF

Chem. Ind. (London) (45):1861-1862. November 7, 1964

Evidence has been obtained that the seed oil of *Leonotis nepetaefolia* (L.) R. Br. (family Labiatae) contains a fatty acid with an allene grouping. Although the complete structure of this acid is not yet known with certainty, present lines of evidence point to it being

2,3-methyleneheptadeca-4,5-dienoic acid. This instance is probably the first of an allene being found as a constituent of seed oil from a higher plant. A few naturally occurring allenes have been identified previously as fungal metabolites.

1753 • Hydrogen-Ion Equilibria of Wheat Gluten in Guanidine-Hydrochloride Solutions

Y. VICTOR WU and ROBERT J. DIMLER

Arch. Biochem. Biophys. 108(3):490-496. December 1964

Hydrogen-ion titration curves of wheat gluten have been studied in 2 *M* and 4 *M* guanidine-hydrochloride (G-HCl) at 25°C. The ionizing groups all appear normal. The empirical electrostatic factor *w* at acid pH was considerably larger than it was at alkaline pH, and a larger decrease in *w* was observed in alkaline

than in acid solutions when the solvent was changed from 2 *M* to 4 *M* G-HCl. These changes in *w* suggest that the conformation of gluten depends on pH and that the conformation in acid solution is more stable. Different methods for purifying G-HCl are discussed.

1754 • Hydrogenation of Linolenate. XI. Nuclear Magnetic Resonance Investigation

A. E. JOHNSTON, C. A. GLASS, and H. J. DUTTON

J. Am. Oil Chemists' Soc. 41(12):788-790. December 1964

Nuclear magnetic resonance spectra have been obtained during hydrogenation of methyl linolenate with platinum, nickel, and sulfur-poisoned-nickel catalysts and during reduction of linolenic acid with hydrazine. Structural changes have been studied by "proton counting"

techniques and include those for total unsaturation (olefinic protons), 15,16-double bond (β -olefinic methyl protons), 1,4-pentadienes (di- α -olefinic methylene protons), and allylic methylene (α -olefinic methylene protons).

1755 • Evidence for an Exocellular Site for the Acid Phosphatase of *Saccharomyces mellis*

RALPH WEIMBERG and WILLIAM L. ORTON

J. Bacteriol. 88(6):1743-1754. December 1964

Evidence is presented that demonstrates an exocellular location for acid phosphatase in *Saccharomyces mellis*: (1) Derepressed intact cells exhibit acid-phosphatase activity. The properties of the system are similar to those shown by the enzyme in cell-free extracts. All the enzyme appears to be outside the cell membrane because there is no increase in total activity when cell-free extracts are prepared. (2) Enzymatically active cell walls were prepared by leaching acetone-dried cells of this yeast in dilute acetate buffer at pH 6.5 plus β -mercaptoethanol. The insoluble residue, consisting mainly of cell wall material and containing the phosphatase, was treated with a variety of hydrolytic enzymes and other chemicals. Only papain and crude snail gut extracts dis-

sociated the enzyme from the particulate fraction. The mechanism of release by these two enzymes probably differs. Of all enzymes tested, only the snail gut extract digested the cell walls. (3) By dividing the procedure for making protoplasts of *S. mellis* into two steps, acid phosphatase may be dissociated from resting cells and recovered as an active soluble enzyme. The first step is to pretreat the cells with a thiol reagent. The second is to digest the cell wall by enzymes present in crude snail gut extracts. Arsenite must be included in the second step to protect the phosphatase from inactivation. Before the cell becomes osmotically fragile, the phosphatase is quantitatively released.

1756 • Modification of Cereal Flours with Hydrochloric Acid

E. B. LANCASTER, K. J. MOULTON, D. UHL, and V. E. SOHNS

Cereal Chem. 41(6):484-491. November 1964

A soft white winter flour predried to less than 3% moisture was modified with 1.3 to 1.6% hydrochloric acid applied as a 4 *N* solution at 90°, 100°, and 110°F. Each 10°F. increase in temperature doubled the rate at which viscosity decreased, as measured by a rapid cooking viscometer. The difference in acid content had little effect. When flour was modified with 0.5% acid, the reaction was relatively slow even at 160°F. When flour

at normal moisture was modified with 12 *N* solution, the rate was retarded.

Data are presented on starches and other cereal flours that illustrate the influence of protein content and type on the reaction rate and on product characteristics. The cost of producing these acid-modified flours is estimated at 1.9 cents per pound above the price of the raw material.

1757 • Carotenoids of Corn and Sorghum. VI. Determination of Xanthophylls and Carotenes in Corn Gluten Fractions

C. W. BLESSIN, J. D. BRECHER, and R. J. DIMLER

Cereal Chem. 41(6):543-548. November 1964

Variation in carotenoid content of corn and of gluten fractions creates problems in blending mixed feeds to guaranteed levels of xanthophylls and carotenes. Samples of hybrid yellow dent corn, typical of those processed by wet millers, showed a three- to fourfold variation in xanthophylls (10 to 30 p.p.m.) and carotenes (1 to 4 p.p.m.). Variation in total carotenoid content (247 to 379 p.p.m.) of two commercial samples of corn gluten containing 60 to 70% protein was of the same magnitude as the differences in carotenoid level (19 to 30 p.p.m.) of the whole corn used for processing. The total carotenoid content of gluten feed (21% protein) varied

from 14 to 34 p.p.m. and that of gluten meal (41% protein) from 65 to 253 p.p.m. Presumably, the carotenoid content of the feed and meal depends to a considerable degree upon the type and amounts of materials blended during processing. The gluten fractions contained larger quantities of noncarotenoid pigments than the whole corns. Saponification of the extracts before chromatography reduced total carotenoid content in several samples. The apparent decrease may be due to conversion of hexane-soluble alkylated flavonoid compounds to water-soluble types during saponification.

1758 • Note on a Simplified Gel Electrophoresis Apparatus Used in Wheat Gluten Protein Research

JAMES E. CLUSKEY

Cereal Chem. 41(6):551-553. November 1964

An apparatus based on direct contact of gel and the voltage-buffer supply is described. Advantages include the ability to use higher voltages and the production of

straighter band patterns than generally are possible with equipment employing a filter-paper bridge.

REPUBLICATION

1614 • Das Verhalten von Mehlen aus Hard Red Winter-Weizen bei der Windsichtung nach unterschiedlicher Vorbehandlung des Weizens

A. C. STRINGFELLOW, V. F. PFEIFER, and E. L. GRIFFIN, JR.

Die Mühle 101(10):165. March 1964

Originally published as "Air-Classification Response of Flours from Hard Red Winter Wheats after Various

Premilling Treatments" in Northwest. Miller 269(12):12, 14, 15. December 23, 1963.

- 1614A • Das Verhalten von Mehlen aus Hard Red Winter-Weizen bei der Windsichtung nach unterschiedlicher Vorbehandlung des Weizens**
 A. C. STRINGFELLOW, V. F. PFEIFER, and E. L. GRIFFIN, JR.
 Die Mühle 101(11):180-181. March 1964

Originally published as Part 2 of the Paper "Air Classification Response of Flours from Hard Red Winter

Wheats after Various Premilling Treatments" in Northwest. Miller 270(1):12, 13, 16-18. January 6, 1964.

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 123-C • Starch Vinylation. Determination of Optimum Conditions by Response Surface Designs**
 JAMES W. BERRY, HENRY TUCKER, and ARCHIE J. DEUTSCHMAN, JR.
 University of Arizona, Tucson
 Ind. Eng. Chem., Process Design Develop. 2(4):318-322. October 1963
- 125-C • Catalysts for Selective Hydrogenation of Soybean Oil.**
I. An Experimental Method for Evaluating Selectivity
 C. H. RIESZ and H. S. WEBER
 Illinois Institute of Technology Research Institute, Chicago
 J. Am. Oil Chemists' Soc. 41(5):380-383. May 1964
- 126-C • Vibration-Stirred Microhydrogenation**
 M. J. D. LOW, R. KRISHNAMURTHY, and H. INOUE
 Rutgers, The State University, New Brunswick, New Jersey
 J. Am. Oil Chemists' Soc. 41(6):433-434. June 1964
- 127-C • Catalysts for Selective Hydrogenation of Soybean Oil.**
III. Hydrogenation Catalysts Prepared on Molecular Sieves and Other Supports
 C. H. RIESZ and H. S. WEBER
 Illinois Institute of Technology Research Institute, Chicago
 J. Am. Oil Chemists' Soc. 41(7):464-468. July 1964

128-C* • Fatty Acids Analysis by High Resolution Nuclear Spin Resonance.**A Preliminary Evaluation**

W. H. STOREY, JR.

Southwest Research Institute, San Antonio, Texas

J. Am. Oil Chemists' Soc. 37(12):676-678. December 1960

129-C* • Wheat Bran Phenols

ERNEST WENKERT, EVA-MARIE LOESER, SHIBA N. MAHAPATRA,

FAUSTO ECHENKER, and EDWARD M. WILSON

Iowa State University, Ames, and Indiana University, Bloomington

J. Org. Chem. 29(2):435-439. February 1964

131-C • The Distribution of Substituents in Vinyl Starch

JAMES W. BERRY, ARCHIE J. DEUTSCHMAN, JR., and JOHN P. EVANS

University of Arizona, Tucson

J. Org. Chem. 29(9):2619-2620. September 1964

132-C • Homopolymers and Terpolymers of 5,7-Dimethyl-1,6-Octadiene

J. M. WILBUR, JR. and C. S. MARVEL

University of Arizona, Tucson

J. Polymer Sci., Part A, 2(10):4415-4423. October 1964

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

62-F* • Studies on Dextran and Dextran Derivatives. I. Properties of Native Dextran in Different Solvents

E. ANTONINI, L. BELLELLI, M. R. BRUZZESI, A. CAPUTO,

E. CHIANCONE, and A. ROSSI-FANELLI

University of Rome, Rome, Italy

Biopolymers 2(1):27-34. February 1964

63-F* • Studies on Dextran and Dextran Derivatives. II. Acid Hydrolysis of Native Dextran

E. ANTONINI, L. BELLELLI, M. L. BONACCI, M. R. BRUZZESI,

A. CAPUTO, E. CHIANCONE, and A. ROSSI-FANELLI

University of Rome, Rome, Italy

Biopolymers 2(1):35-42. February 1964

- 64-F • **Attività Enzimatiche di *Acetobacter suboxydans*. Influenza del pH sulle Attività 5-Chetogene di Frazioni Subcellulari**

[Enzymatic Activity of *Acetobacter suboxydans*. Influence of pH on 5-Ketogenic Activity of the Subcellular Fraction]

P. SCALAFFA and E. GALANTE

University of Milan, Milan, Italy

Boll. Soc. Ital. Biol. Sper. 40(11):591-594. February 1964

- 65-F* • **Engymatic Activities in *Acetobacter suboxydans*. II. Production of 5-Ketoglucuronate**

E. GALANTE, P. SCALAFFA, and G. A. LANZANI

University of Milan, Milan, Italy

Enzymologia 27(3):176-184. August 1964

- 66-F* • ***Piptocephalis indica* sp. nov. and *Piptocephalis* sp. from India**

B. S. MEHROTRA and USHA BAIJAL

University of Allahabad, Allahabad, India

Sydowia, Ann. Mycol., Ser. II, 17(1):171-173. June 1964

- 67-F • **Interaction of Starch with Iodine**

JEHUDAH ELIASSAF and MENACHEM LEWIN

Institute for Fibres and Forest Products Research

Ministry of Commerce and Industry, Jerusalem, Israel

Nature 201(4923):1023-1024. March 7, 1964

[Report of research work done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 1-G • **Synthesis of Unsaturated Sugars from *trans*-Diol Precursors and Through Thiocarbonate Intermediates**

D. HORTON and W. N. TURNER

The Ohio State University, Columbus

Tetrahedron Letters (36):2531-2534. September 1964

July — December 1964



PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (25 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Linseed Oil Emulsion Compositions Comprising Dipicolinate and Linseed Oil-Derived Emulsifiers

WILLIAM L. KUBIE

U. S. Patent 3,140,191. July 7, 1964

The addition of a soluble salt of dipicolinic acid dissolved in ethylene glycol to zinc oxide-containing linseed oil-in-water emulsion paint formulations permits marked reductions in metallic drier content while increasing the shelf life thereof and stabilizing the emulsion

against inversion. These advantages are further increased by substituting linseed oil-derived hydrophobic and hydrophilic emulsifiers for the conventional oleic acid-based emulsifiers.

Polymeric Dialdehyde-Protein Adhesives and Wood Laminates Therewith

FRANCIS B. WEAKLEY and CHARLES L. MEHLTRETTER

U. S. Patent 3,153,597. October 20, 1964

A strong and exceptionally weather-resistant cold-setting plywood glue that retains high shear strength even after exposure to boiling water and that, because of its nonstain glue line, is as suitable for use in decorative indoor veneers as in outside laminates is prepared

by reacting a slightly acid to slightly alkaline dispersion of casein or soybean alpha protein with 2.5-5.0% (based on the protein) of dispersed periodate-oxidized dialdehyde starch containing at least 90% of theory of aldehyde groups.

Caffeoyl Glycerides

HAROLD G. C. KING

U. S. Patent 3,153,659. October 20, 1964

Caffeic acid esters of glycerol comprise novel compounds having antioxidant activity for unstable food-stuffs including fats and oils. They are tailored for solubility in polar or nonpolar substrates by forming the mono-, di-, or tri-caffeoyl glycerides through a condensation of dicarbomethoxy caffeoyl chloride with anhy-

drous glycerol in the presence of quinoline and chloroform solvents. Alternatively, a saturated fatty acid monoglyceride, such as monopalmitin, may be substituted for glycerol. Specific compounds include mono-(dicarbomethoxy caffeoyl) glycerol, di-(dicarbomethoxy caffeoyl) monopalmitin, and tri-(dicarbomethoxy caffeoyl) glycerol.

Cellulosic Pulps Comprising Crosslinked Cereal Pulps and Products Made Therewith

CHARLES R. RUSSELL, RUSSELL A. BUCHANAN, and CARL E. RIST

U. S. Patent 3,160,552. December 8, 1964

Paper and related cellulosic products including greaseproof paper and boxboard and consisting of from 4 to about 44% by weight (about 90% based on the cellulose fiber content) of a starch, flour, wheat bran, whole wheat, dextrin, or polysaccharide gum xanthate that has been crosslinked *in situ* on the cellulose fibers in a beater or other wet-end point by iodine, chlorine, zinc chloride, or ferric chloride to form the corresponding "cereal pulp" disulfurdithiocarbonates or metal di-

thiocarbonates have greatly increased wet strengths and fold endurance over the corresponding all-cellulose products. Incorporating the cereal pulp disulfurdithiocarbonates or metal dithiocarbonates improves the drainage of water from a papermaker's pulp and improves the transparency of greaseproof-type papers therefrom, thus providing a method of improving the freeness of a cellulose furnish.

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Similar lists of publication abstracts and patents are available from the other three Regional Utilization Research and Development Divisions of the Agricultural Research Service, U. S. Department of Agriculture. The addresses and fields of research covered are:

Division	Principal Fields of Research
<p>Eastern Utilization Research and Development Division 600 East Mermaid Lane Philadelphia, Pennsylvania 19118</p>	<p>Animal products: dairy, meat, fats, and leather; plant products: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; and allergen studies.</p>
<p>Southern Utilization Research and Development Division Post Office Box 19687 New Orleans, Louisiana 70119</p>	<p>Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citric, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts; and new crops.</p>
<p>Western Utilization Research and Development Division 800 Buchanan Street Albany, California 94710</p>	<p>Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat and barley; wool and mohair; sugar beets; dry beans and peas; castor beans; and new crops.</p>

